

Translation

PATENT COOPERATION TREATY

PCT

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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| Applicant's or agent's file reference 03SGL0303WOP | FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) | |
| International application No. PCT/EP2003/010222 | International filing date (day/month/year) 13 September 2003 (13.09.2003) | Priority date (day/month/year) 14 September 2002 (14.09.2002) |
| International Patent Classification (IPC) or national classification and IPC C03C 17/34 | | |
| Applicant SCHOTT AG | | |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

| | |
|--|--|
| Date of submission of the demand 29 January 2004 (29.01.2004) | Date of completion of this report 22 December 2004 (22.12.2004) |
| Name and mailing address of the IPEA/EP | Authorized officer |
| Facsimile No. | Telephone No. |

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International Application No.

PCT/EP2003/010222

I. Basis of the report

1. With regard to the elements of the international application:*

- ☐ the international application as originally filed
- ☒ the description:
pages _____ 1-14 _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☒ the claims:
pages _____ 1-22 _____, as originally filed
pages _____, as amended (together with any statement under Article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☒ the drawings:
pages _____ 1/2-2/2 _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

| | | | |
|-------------------------------|--------|----------------|-----|
| Novelty (N) | Claims | 7-9, 11-15 | YES |
| | Claims | 1-6, 10, 16-22 | NO |
| Inventive step (IS) | Claims | 7-9, 11-15 | YES |
| | Claims | 1-6, 10, 16-22 | NO |
| Industrial applicability (IA) | Claims | 1-22 | YES |
| | Claims | | NO |

2. Citations and explanations

Reference is made to the following documents:

D1: US-A-5 944 964 (POND BRADLEY JAMES ET AL)

D2: US-A-5 705 277 (BERNARD CLAUDE ET AL)

1 Novelty and inventive step

D1 (see column 9, line 44 to column 10, line 26) discloses a glass substrate with at least one functional layer which is interrupted by at least one intermediate layer of 1-2 nm in order to influence morphology.

D1 (column 8, line 43 to column 9, line 43, and column 14, line 26 to column 15, line 4) further discloses influencing the morphology of the functional layer during the coating process.

D1, claims 1-5, describes such influencing and the associated increase in reflectance.

Therefore, the present application does not meet the requirements of PCT Article 33(1) because the subject matter of claims 1-6, 10 and 16-22 is not

novel within the meaning of PCT Article 33(2).

D2 (column 2, lines 13-49, and example 4) describes the column structure in magnetron-sputtered Cr coatings. However, interruption of said column structure is not disclosed in the prior art.

The solution to this problem proposed in claim 7 of the present application therefore involves an inventive step (PCT Article 33(3)).

Claims 8, 9 and 11-15 are dependent on claim 7 and therefore likewise meet the PCT requirements for novelty and inventive step.

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Schott AG

Patent Claims

1. A process for coating a substrate (1) with at least one
5 functional layer (2), comprising the steps of:
- a) providing the substrate (1) and the layer starting material in a vacuum system (5), and
 - b) coating the substrate (1) with a functional layer (2) by sputtering of the layer starting material, wherein
- 10 b1) the sputtering of the layer starting material for coating of the substrate (1) with a functional layer (2) is interrupted at least once to produce an intermediate layer (4), which is different than the functional layer and has a thickness of ≤ 20 nm,
- 15 b2) the sputtering of the layer starting material is continued after the interruption with the transmittance and/or reflectance of the functional layer being increased.
- 20 2. The process for coating a substrate (1) as claimed in claim 1, wherein the coating of the substrate (1) by means of a functional layer (2) is realized by means of magnetron sputtering of the layer starting material.
- 25 3. The process for coating a substrate (1) as claimed in claim 2, wherein the functional layer is applied by means of a magnetron sputtering process having a sputtering installation which includes a vacuum chamber in which a substrate holder comprising a drum and, at the walls of the
- 30 vacuum chamber, targets of the layer starting materials are located.

4. The process for coating a substrate (1) as claimed in one of the preceding claims, wherein a plurality of functional layers (2) are applied, in particular as an
5 alternating layer system made up of functional layers (2) with a low refractive index and functional layers (2) with a high refractive index.

5. The process for coating a substrate (1) as claimed in
10 claim 4, wherein the functional layers (2) with a low refractive index are interrupted by sputtering intermediate layers (4) with a high refractive index and/or the functional layers (2) with a high refractive index are interrupted by sputtering intermediate layers (4) with a low refractive
15 index, the intermediate layers remaining below a thickness at which they become optically active, preferably ≤ 10 nm.

6. The process for coating a substrate (1) as claimed in claim 5, wherein the functional layers (2) with a low
20 refractive index and the intermediate layers (4) with a low refractive index consist of SiO_2 by virtue of silicon being sputtered in a reactive atmosphere, and the functional layers (2) with a high refractive index and the intermediate layers (4) with a high refractive index consist of ZrO_2 by virtue of
25 zirconium being sputtered in a reactive atmosphere.

7. The process for coating a substrate (1) as claimed in one of claims 1 to 3, wherein a pure metal layer is applied as functional layer (2) by sputtering a metal.

30 8. The process for coating a substrate (1) as claimed in claim 7, wherein the interruption to the sputtering of the functional layer (2) is effected by introducing an oxygen-rich microwave plasma into the vacuum chamber, with an
35 intermediate layer (4) consisting of metal oxide by virtue of

the surface of the functional layer (2) of metal which has previously been grown being oxidized.

5 9. The process for coating a substrate (1) with a functional layer (2) as claimed in claim 8, wherein the functional layer (2) is applied by sputtering chromium.

10 10. The process for coating a substrate (1) as claimed in one of the preceding claims, wherein the substrates (1), on a drum (7) located inside the vacuum chamber, rotate past targets (10, 11, 12) comprising the layer starting materials and an oxygen source (8).

15 11. A coated substrate (1) having at least one functional layer (2) formed from a metal, wherein the functional layer (2) has at least one intermediate layer (4) of a metal oxide which interrupts it and is ≤ 10 nm thick.

20 12. The coated substrate (1) as claimed in claim 11, wherein the functional layer (2) is a chromium layer.

25 13. The coated substrate (1) as claimed in one of claims 11 and 12, wherein the interrupting intermediate layer (4) of a metal oxide is a chromium oxide layer.

14. The coated substrate (1) as claimed in one of claims 11 to 13, which is producible by the process as claimed in claims 7 to 10.

30 15. The coated substrate as claimed in one of claims 11 to 14, which is used as a substrate for lithographic processes.

35 16. A coated substrate (1) having at least one functional layer (2) of a metal oxide, wherein the functional layer (2) has at least one intermediate layer (4) of a metal oxide

which interrupts it and remains below a thickness at which it is optically active.

5 17. The coated substrate (1) as claimed in claim 16, which comprises an alternating layer system made up of functional layers with a high refractive index and functional layers with a low refractive index.

10 18. The coated substrate (1) as claimed in claim 17, wherein the functional layer (2) with a low refractive index consists of SiO_2 and the functional layer (2) with a high refractive index consists of ZrO_2 .

15 19. The coated substrate (1) as claimed in claim 18, wherein the interrupting intermediate layer (4) of a metal oxide in a functional layer (2) with a high refractive index formed from ZrO_2 is an intermediate layer (4) with a low refractive index formed from SiO_2 , and the interrupting intermediate layer (4) of a metal oxide in a functional layer (2) with a low
20 refractive index formed from SiO_2 is an intermediate layer (4) with a high refractive index formed from ZrO_2 .

25 20. The coated substrate (1) as claimed in one of claims 16 to 19, which is producible by the process as claimed in claims 4 to 6.

21. The coated substrate as claimed in one of claims 16 to 20, which is used as an optical element.

30 22. The coated substrate as claimed in claim 21, which is used as a color filter.